

REMARKS/ARGUMENTS

Favorable reconsideration of this application is requested in view of the above amendments and in light of the following remarks and discussion.

Claims 4-8, 11, 13-15, and 18-31 are pending. Claims 1-3, 12, 16, and 17 are canceled. Claims 4-7, 11, and 22-27 are withdrawn. Claim 8 is amended. Claims 28-31 are newly added. Support for the amendment to Claim 8 can be found in the specification on page 40, lines 4-7, for example. Support for newly added dependent Claim 28 can be found on page 37, lines 5-7, for example. Support for newly added dependent Claims 29 and 31 can be found in Figs. 8A and 8B, for example. Support for newly added Claim 30 can be found in Fig. 10, for example. No new matter is added.

In the outstanding Office Action, Claims 8, 13-15, and 18-20 were rejected under 35 U.S.C. § 103(a) as obvious over Koshiishi et al. (U.S. Patent Pub. No. 2003/0106647, herein “Koshiishi”) in view of Kanno et al. (U.S. Patent No. 6,373,681, herein “Kanno”), Howald et al. (U.S. Patent No. 6,125,025, herein “Howald”), and Birang et al. (U.S. Patent No. 5,491,603, herein “Birang”). Claim 21 was rejected under 35 U.S.C. § 103(a) as obvious over Koshiishi, Kanno, Howald, Birang and Huang (U.S. Patent Pub. No. 2004/0005726, herein “Huang”).

Regarding the rejection of Claims 8, 13-15, and 18-20 as obvious over Koshiishi, Kanno, Howald, and Birang, that rejection is respectfully traversed by the present response.

Amended independent Claim 8 recites, in part:

said controller controls a pressure of the heat transfer gas supplied from said heat exchange means and changes the pressure of the heat transfer gas supplied in accordance with each of multiple steps of the plasma process; and

the chuck voltage and the pressure of the heat transfer gas are not set to zero so as to carry out cooling of said focus ring during conveying the object to be processed into and out from said chamber.

Accordingly, the chuck voltage and the pressure of the heat transfer gas are not set to zero so as to carry out cooling of the focus ring during conveying the object to be processed into and out from the chamber.

One benefit provided by the above-noted arrangement is that it is possible to prepare for the dry etching of the next wafer W, i.e. to completely remove the heat from the focus ring (30), and thus make the dry etching conditions uniform for all of the wafers W.

Koshiishi describes changing a DC voltage applied to a wafer-attracting electrode (22) (see paragraph [0057]). However, Koshiishi neither discloses nor suggests controlling the DC voltage in order not to set the DC voltage to zero during conveying a wafer into and out from a chamber. Instead, Koshiishi states “while the wafer W is being transferred, the switch (24) is OFF to stop application of the DC voltage to the wafer-attracting electrode W can be released.”¹

The outstanding Office Action acknowledges that Koshiishi fails to disclose that a controller sets the chuck voltage applied to the chuck device high during at least one processing sequence, and controls the chucking voltage with each of multiple sequences of a plasma process. The outstanding Office Action relies on Howald for the above-noted feature.

Howald describes reducing, as a function of time, the value of a voltage applied by a source (38) to a chuck (30) clamping a workpiece as a substrate (see col. 15, lines 59 to 64), and controlling the source (38) to derive a sequence of time spaced decreasing step voltages during processing of glass (substrate) (see col. 16, lines 7 to 9). However, Howald neither discloses nor suggests controlling the value of the voltage in order not to set the value of the voltage to zero during conveying the workpiece into and out from the chamber (10).

¹ Koshiishi, paragraph [0057].

Accordingly, Koshiishi and Howald no proper combination of would include controlling the DC voltage in order not to set the DC voltage to zero during conveying a wafer into and out from a chamber are recited in amended independent Claim 8.

The outstanding Office Action relies on Kanno for the feature of an electrostatic chuck with a plurality of grooves and relies on Birang for a controller that controls pressure of a heat exchange gas during processing steps. Neither of these references remedies the deficiencies discussed above regarding Koshiishi and Howald.

Moreover, Kanno describes that an electrostatic chuck has a structure in which a wafer mounting surface of the chuck is provided with a dispersion groove (see col. 2, lines 49 to 59). However, Kanno neither discloses nor suggests controlling the pressure of a heat transfer gas supplied into the dispersion groove in order not to set the pressure of the heat transfer gas to zero during conveying a substrate (9) into and out from a vacuum chamber (1).

Birang describes controlling the pressure of an inert gas such as helium pumped against the bottom side of a semiconductor wafer (101) in respective processing steps (see col. 7, lines 28 to 31 and 57 to 61). However, Birang neither discloses nor suggests controlling the pressure of the helium in order not to set the pressure of the helium to zero during conveying the semiconductor wafer (101) into and out from an enclosure (105).

Further, new Claim 28 recites evacuating the supply path when reducing a pressure inside the chamber, which no proper combination of the cited references discloses or suggests.

Further, new Claim 29 recites specific features in controlling the pressure of the heat transfer gas and the chuck voltage during the process sequence, which no proper combination of the cited references discloses or suggests.

Furthermore, new Claim 30 recites a heating member in contact with the focus ring which no proper combination of the cited references discloses or suggests.

Accordingly, Applicants respectfully submit that no proper combination of Koshiishi, Kanno, Howald, and Birang would include all of the features recited in amended independent Claim 8 or Claims 13-15 and 18-20 depending therefrom.

Regarding the rejection of Claim 21 as obvious over Koshiishi, Kanno, Howald, Birang, and Huang, that rejection is respectfully traversed by the present response.

Claim 21 depends from amended independent Claim 8 and patentably distinguishes over any proper combination of Koshiishi, Kanno, Howald, and Birang for at least the same reasons as amended independent Claim 1 does.

Huang describes a heat transfer means controlling a temperature of a focus ring to within a range of $100^{\circ}\text{C} \pm 30^{\circ}\text{C}$.² However, Huang fails to teach or suggest a controller that controls a chuck voltage applied to a chuck device, said controller changing the chuck voltage in accordance with each of the sequences of a plasma process. Accordingly, Huang does not teach a controller that controls the chuck voltage and the pressure of a heat transfer gas so as not to set these parameters to zero during conveying of the object to be processed into and out from a chamber as recited in amended independent Claim 8.

Consequently, Applicants respectfully submit that no proper combination of the cited references would include all of the features recited in amended independent Claim 8 or the claims depending therefrom, and the rejection of Claim 21 as obvious over Koshiishi, Kanno, Howald, Birang, and Huang is overcome.

Newly added dependent Claims 28-31 depend from amended independent Claim 8 and patentably distinguish over any proper combination of the cited references for at least the same reasons as amended independent Claim 8 does.

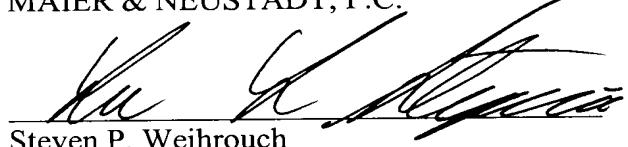
² Huang, paragraph 25.

For the foregoing reasons, it is respectfully submitted that this application is now in condition for allowance. A Notice of Allowance for Claims 8, 11, 13-15, 18-21, and 28-31 is earnestly solicited.

Should Examiner Dhingra deem that any further action is necessary to place this application in even better form for allowance, Examiner Dhingra is encouraged to contact Applicants' undersigned representative at the below-listed telephone number.

Respectfully submitted,

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